NSN 1H6625-01-213-9354 TE

77/BN
MULTIMETER

Operator Manual

PN 900865
APRIL 1991
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FLUKE®

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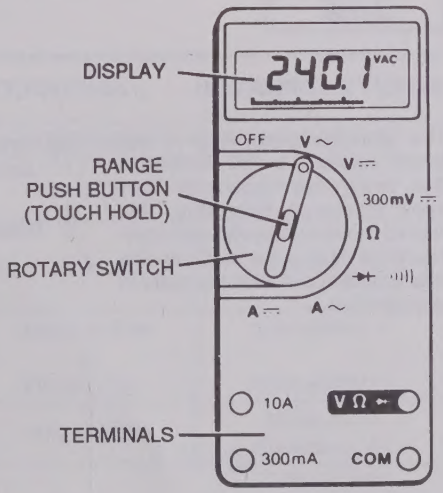


FOR ASSISTANCE, CALL 1-800-443-5853

FOR SERVICE CONTACT: Fluke Techincal Center
John Fluke Mfg. Co., Inc.
1420 75th St. S.W.
Everett, WA 98203
(206)356-5560

SAFETY INFORMATION

This meter has been designed and tested according to IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus. This manual contains information and warnings which must be followed to ensure safe operation and keep the meter in safe condition.

SAFETY SYMBOLS

⚠ Refer to an explanation in this manual.

Dangerous voltages may exist.

MULTIMETER SYMBOLS

AC rms

DC

Fuse

Double Insulation (Protection Class II)

Battery

AC Source

Audio

Diode Test

Red Test Lead

Black Test Lead

FUNCTIONS

WARNING

TO AVOID ELECTRICAL SHOCK OR DAMAGE TO THE METER, DO NOT APPLY MORE THAN 1000V DC OR 750V AC RMS BETWEEN ANY TERMINAL AND EARTH GROUND.

CAUTION

To avoid damage to the meter, do not exceed the input limits shown in Table 1. The A~ and A⎓ input limits are explained further under "Current Measurement."

Table 1.

FUNCTION	TERMINALS	INPUT LIMITS
V~ (VAC) V⎓ (Vdc)	VΩ⊣⊢& COM	1000V⎓ 750V ~
300mV⎓ (Vdc) Ω ⊣⊢)))	VΩ⊣⊢& COM	500V⎓ 500V~
A ~ (AC) A ⎓ (dc)	300mA & COM or 300mA & 10A	320mA/600V ⎓ 320mA/600V ~
	10A & COM	20A/600V ⎓ 20A/600V ~*

* 10A continuous
20A for 30 sec. max.

CAUTION

• Always be careful when working with voltages above 60V dc or 25V ac rms. Such voltages pose a shock hazard.

• Always keep your fingers behind the finger guard on the probe when making measurements.

• Always use a high voltage probe to measure voltage if the peak voltage might exceed 1000V.

• To avoid accidentally applying voltage to the 10A terminal, verify that the red test lead is connected to the V input terminal before making a voltage measurement.

• To avoid damage or injury, never use the meter on unprotected circuits that exceed 4800 volt-amps.

The following items are furnished with your multimeter:

77/BN DMM (1)

Test Lead Set (1)

Operator Manual (2)

Holster (1)

WARNING

TO AVOID ELECTRICAL SHOCK:

• USE CAUTION WHEN WORKING ABOVE 60V DC OR 25V AC RMS. SUCH VOLTAGES POSE A SHOCK HAZARD.

• ENSURE THAT THE TEST LEADS ARE IN GOOD CONDITION.

CAUTION

To avoid damage to the meter:

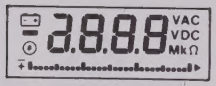
• Above 500V, disconnect the test leads from the test points before changing functions.

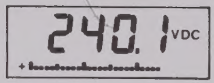
• Clean the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

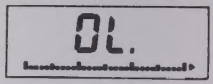
NOTE

• For correct readings in Ω and →+))))) ensure that the power is off in the device being tested.

• Environments with rf noise or arcing may cause improper display of symbols; to reset the meter, momentarily turn the rotary switch to OFF.







DISPLAY FEATURES

Power-Up Selftest

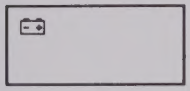
When the meter is turned on, all display segments appear while the instrument performs a brief selftest. At the end of the test, the meter beeps once and begins taking readings.

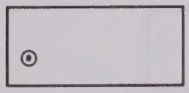
Readings

The digital display is updated 2 1/2 times per second. For negative voltage or current readings, a minus (-) sign appears next to the first digit. The analog display gives a graphic indication of the input level. The display updates 25 times per second and has separate polarity indicators.

Overload Indication

These symbols indicate that the input is too large to display. (The location of the decimal point depends on the measurement range.) Select the next higher range.





Standby

To extend battery life, the display blanks after 1 hour (20 minutes in →⊢))) if the meter is not being used. To resume operation, turn the rotary switch.

Low Battery Indicator

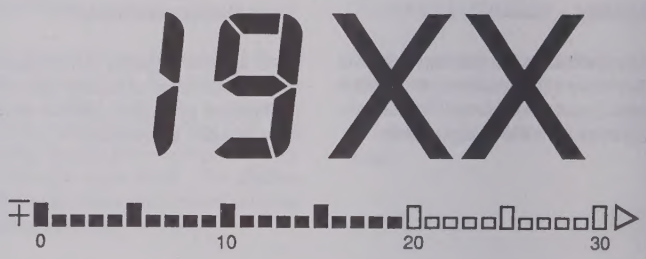
This symbol appears when approximately 100 hours of battery life remain. For proper operation, replace the battery as soon as possible.

Range Hold and Touch Hold

This symbol indicates that either Range Hold or Touch Hold is activated.

ANALOG DISPLAY

The analog display is especially helpful for peaking and nulling and for observing rapidly changing inputs. The bar indicates the magnitude of the input compared to the full scale value of the measurement range in use. (See Figure 1.) In **V⎓**, 300 **mV⎓**, and **A** ⎓, a + or - indicates the polarity of the input. (Near zero, the + and - blink evenly.) In all other functions, the + disappears, but the - still appears near zero.



The bar shown above is a graphic representation of the two left digits (19) of the measured value. XX represents any number. Each bar segment represents 100 counts in the digital display.

Figure 1.

Table 2.

FUNCTION	RANGE	DISPLAY
V~ V⎓	3.2V	g.ddd VAC/Vdc
	32V	gd.dd VAC/Vdc
	320V	gdd.d VAC/Vdc
	1000V	gddd VAC/Vdc
300mV⎓	320mV	gdd.d
Ω	320Ω	gdd.dΩ
	3200Ω	gddd Ω
	32kΩ	gd.ddΩ
	320kΩ	gdd.dkΩ
	3.2MΩ	g.dddMΩ
	32MΩ	gd.ddMΩ
→+)))	2V	g.ddd
A~ A⎓	32mA	gd.dd AC/dc
	320mA	gdd.d AC/dc
	10A	gd.dd AC/dc

AUTORANGE

The meter powers up in autorange. In autorange, the meter automatically selects the measurement range that gives the best resolution. The display indicates ***OL*** while the meter goes to a higher range, and blanks while the meter goes to a lower range. The range can be interpreted from the display as shown in Table 2. (In this table, d = digit and g = 1, 2, or 3 only.)

RANGE HOLD

Range Hold lets you select a fixed measurement range. The display will indicate ***OL*** if a measurement is too large to display in the selected range. If the display indicates ***OL***, select the next higher range.

To enable range hold:

1. Turn the rotary switch to any function except 300 mV⎓ or →|←))), and press the range push button. The meter will display ⊙.

2. Press the range push button again to change the range. The meter will beep once for each change.

To return to autorange:

Press the range button for 1 second. The meter will beep twice and return to autorange.

TOUCH HOLD

In Touch Hold, the meter "captures" a reading when the test leads touch a circuit or when the range push button is pressed. This allows you to lift the test leads before reading the display.

WARNING

DO NOT USE TOUCH HOLD TO DETERMINE IF A CIRCUIT WITH HIGH VOLTAGE IS DEAD.

The meter will capture a reading if the input is constant for 1/2 second and if at least one segment of the analog display differs from the previous reading. However, the meter will not capture a reading if the input is overrange or near zero volts or amps. *In some functions, therefore, the meter may not display a reading on power-up.* Pressing the range push button will force a reading. The Touch Hold is always in autorange, so the meter will up-range if necessary.

Open test leads in noisy environments may pick up stray signals. It is therefore possible for an unwanted update (signaled by an extra beep) to occur. An unwanted update is most likely to occur in one of the following situations:

1. When test leads are exposed to large rf or other ac fields.

2. When one test lead is connected to a voltage source and the other test lead body is held by the operator.

3. When the high side (red) metal probe tip is touched by the operator.

4. When used in high voltage environments where dielectric energy, stored in materials and on operator's hands, is released slowly into open leads just after making a Touch Hold measurement above a few hundred volts.

TOUCH HOLD

To reduce the likelihood of a spurious reading, take the following precautions;

1. Connect the COM lead (black) firmly to circuit ground, or earth, before using the Touch Hold. If both probes are hand held, and circuit ground is unknown or unavailable, try to touch both probes simultaneously to the measured circuit.

2. Minimize hand contact with test probes; a good technique is to hold the probes with fingertips only.

3. Short the probe leads together as soon as possible after a Touch-Hold reading has been acquired.

4. Use shielded test leads or a coaxial cable adapter.

5. For high voltage measurements, separate test leads from each other (do not twist together).

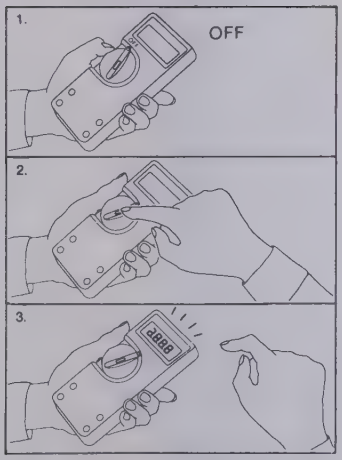


Table 2.

To activate Touch Hold:

1. Turn the rotary switch to OFF.

2. While pressing the range push button, turn the rotary switch to any function.

3. When the display segments appear clearly, release the range push button. TO DEACTIVATE: Turn the rotary switch to OFF.

To use Touch Hold:

1. Touch the test leads to the test points. The meter will take a reading and beep.

2. Disconnect the test leads from the test points. The meter will hold the reading in the display.

3. Read the display.

V~
V⎓
300mV⎓ **V**

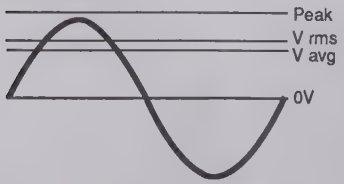
Refer to the warnings and cautions on pages 3 and 5.

VOLTAGE MEASUREMENT

WARNING

TO AVOID DAMAGE OR INJURY, NEVER ATTEMPT TO MEASURE VOLTAGE WITH A TEST LEAD IN THE 10A OR 300 mA INPUT JACK.

Select the VAC or VDC function **V~** or **V⎓**, and connect the test leads as shown. Select the 300 **mV⎓** function for best resolution below 320 mV dc. In the 300 **mV⎓** function, readings are displayed in mV, and the VDC symbol blanks. VAC is average responding and calibrated for the rms value of a sine wave (V rms = 1.111 x V avg).



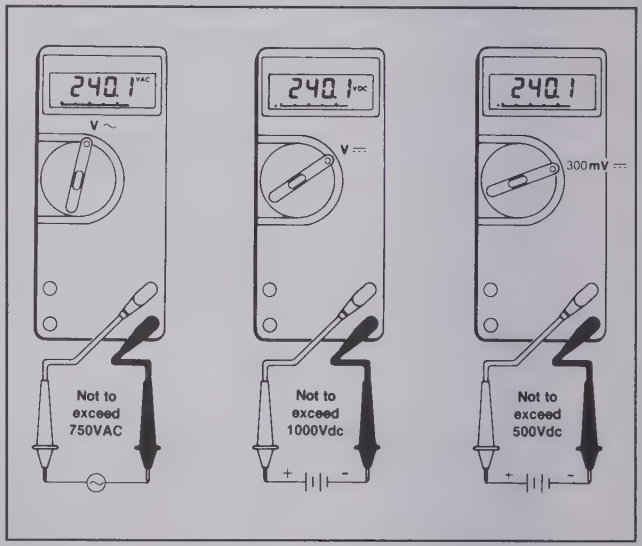


Figure 3.

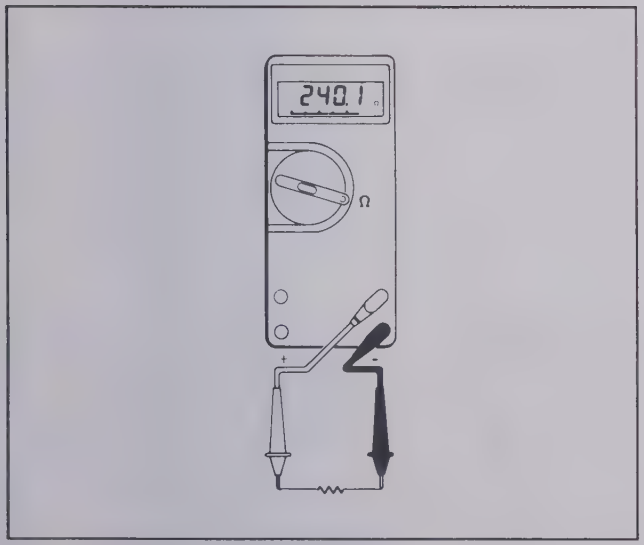


Figure 4.

RESISTANCE MEASUREMENT

Connect the test leads as shown. Units are indicated by Ω, kΩ, or MΩ in the display. For correct readings, ensure that the device being tested contains no voltage. (Negative readings may result if voltage is present.)

CAUTION

Voltages exceeding 500V may damage the meter.

DIODE TEST

Forward bias: The meter displays the forward voltage drop (V_F) up to 2V, and beeps briefly for one diode drop (V_F<0.7V). *Reverse bias or open circuit:* The meter displays ***OL***. *Short circuit:* The meter emits a continuous tone.

CAUTION

Voltages exceeding 500V may damage the meter.

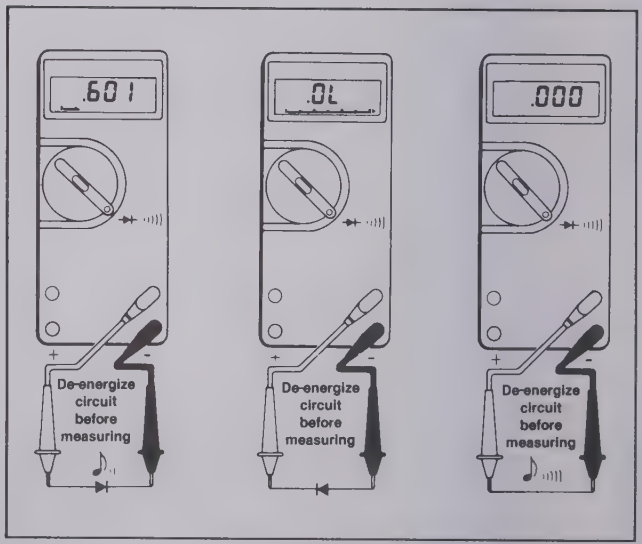


Figure 5.

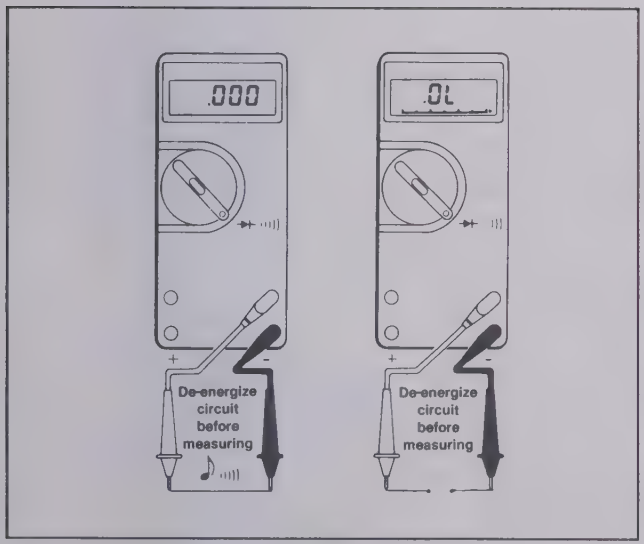


Figure 6.

CONTINUITY BEEPER

A continuous tone sounds if the resistance between the terminals is less than approximately 150Ω (100 counts in the display). The display indicates the approximate test voltage across the terminals. (In Touch Hold, continuity caused two beeps.)

CAUTION

Voltages exceeding 500V may damage the meter.

CURRENT MEASUREMENT

CAUTION

De-energize the circuit before connection the test leads in series with the load.

Refer to the Figure 7 on page 19 for the correct sequence for measuring current. Before energizing the circuit, make sure connections are secure and that the function switch is in the ampere position **A** ~ or **A**⎓. De-energize the circuit before removing the test leads from the circuit and reconnecting the break in the circuit (step 2).

Be sure to reinsert the test leads in the voltage terminals and return the function switch to voltage position **V**~ or **V**⎓ before making subsequent voltage measurements.

Select the ac or dc function **A** ~ or **A**⎓. For measurements up to 320 mA, connect the test leads to the 300 mA and COM terminals, or alternatively, to the 300 mA and 10A terminals (not illustrated).

The 300 mA and 10A terminals are limited to 630 mA and 15A repectively by a protective fuse and a protective resistor. If the fuse blows, the meter will display approximately zero. A fuse test is shown under "OPERATOR MAINTENANCE."

For measurements up to 10A, use the 10A and COM terminals. The 10A and COM terminals may also be used for measurements between 10A and 20A for up to 30 seconds. Exceeding 30 seconds or 20A may damage your meter.

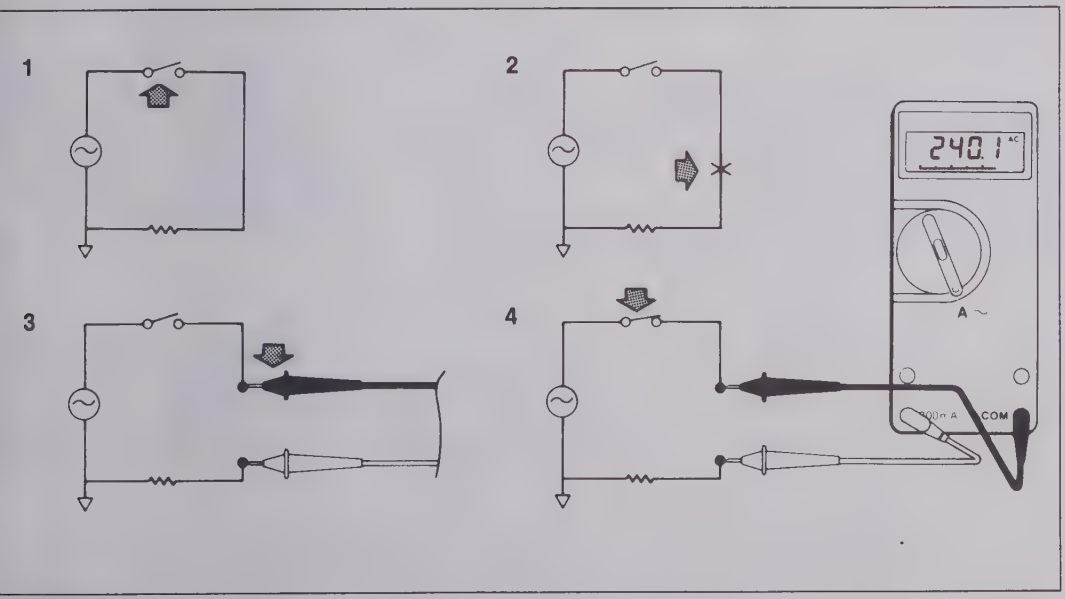


Figure 7.

HOLSTER

The snap-on holster absorbs shocks and protects the meter. The holster comes with a Flex-Stand™. To protect the front of the meter, put the meter face down in the holster. Some uses of the holster and Flex-Stand are shown.

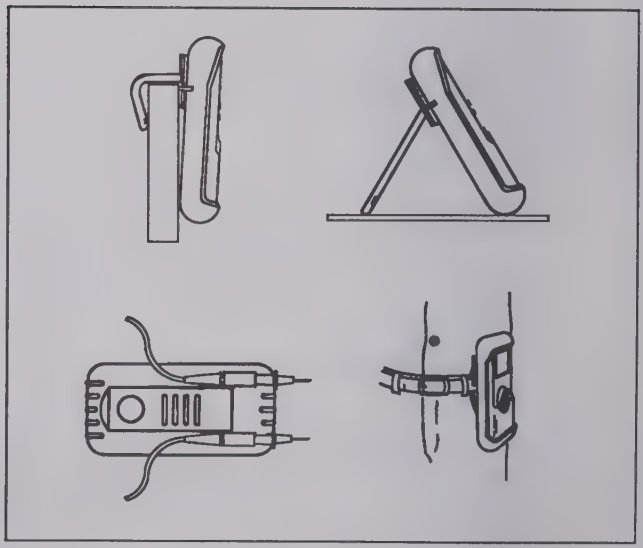


Figure 8 .

WARNING

TO AVOID ELECTRICAL SHOCK, REMOVE THE TEST LEADS BEFORE OPENING THE CASE, AND CLOSE THE CASE BEFORE OPERATING THE METER. TO PREVENT FIRE, INSTALL FUSES WITH THE RATING SHOWN ON THE BACK OF METER.

CAUTION

To avoid damaging the components, lift the end of the battery upward as shown; do not pull the battery straight out. To avoid contamination or static damage, do not touch the rotary switch or circuit board.

Internal Fuse Test ⚠

WARNING

IF IMPROPER FUSES ARE USED, DAMAGE TO THE METER AND POSSIBLE ELECTRICAL SHOCK MAY OCCUR.

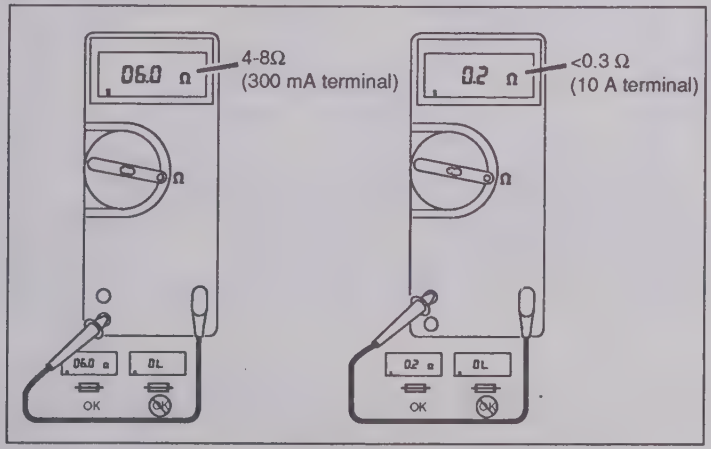


Figure 9.

⚠ Battery/Fuse Replacement

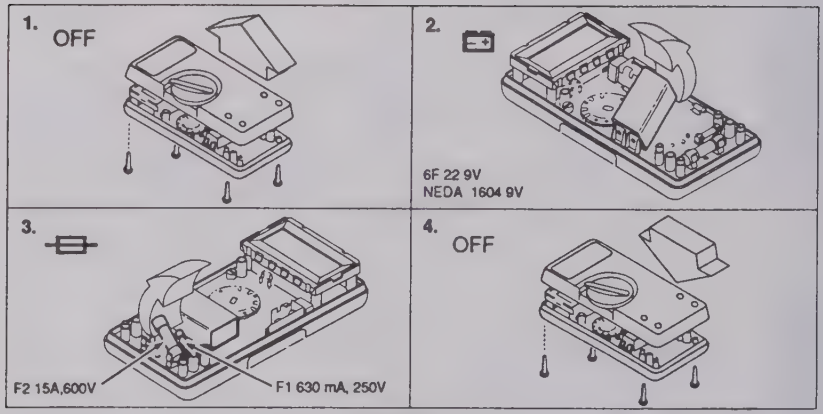


Figure 10.

For replacement parts call
1-800-526-4731

ITEM	NUMBER
F1	740670
F2	820829
Service Manual	896204
TL.75-Test Leads	855742

⚠ Calibration

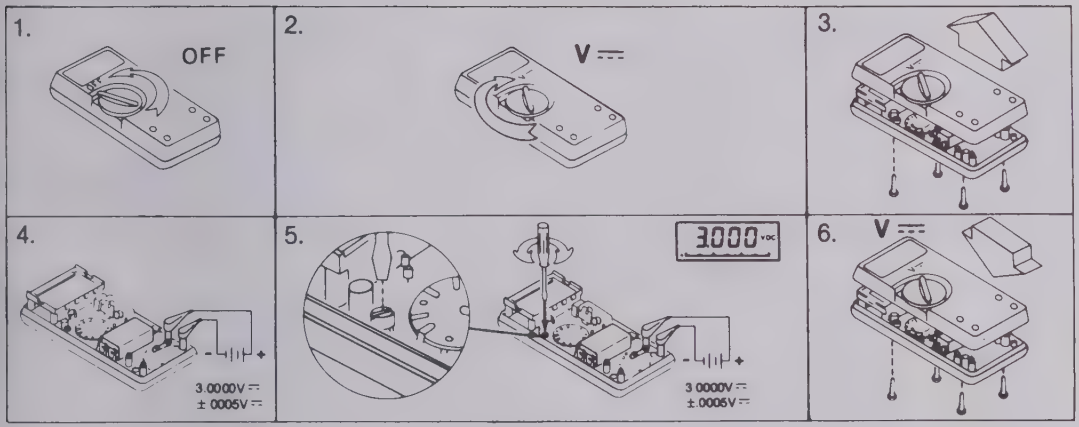


Figure 11.

(CALIBRATION INTERVAL - 36 MONTHS. TO BE PERFORMED BY A QUALIFIED TECHNICIAN ONLY.)

SPECIFICATIONS

Table 3.

Item	Description	Item	Description
Operating Temperature	-10°C to 55°C	Battery Type	NEDA 1604 9V or 6F 22 9V
Storage Temperature	-51°C to 71°C	Battery life (typical)	600 hrs Zn-c 2000 + hrs alkaline
Relative Humidity	0% to 95%± 5% (-10°C to 55°C	Size (HxWxL)	2.84cm x 7.49cm 16.64cm (1.12 in x 2.95 in x 6.55 in)
Temperature Coefficient	0.1 x (specified accuracy)/°C (applies from -10°C to 20°C and from 30°C to 55°C	Weight	0.34kg (12 ounces)
		Safety Rating	Protection Class II per IEC 348

Table 3. (cont)

FUNCTION	RANGE	RESOLUTION	ACCURACY
V⎓	3.2V	0.001V	±(0.5+1)*
	32V	0.01V	±(0.5+1)
	320V	0.1V	±(0.5+1)
	1000V	1V	±(0.5+1)
300mV⎓	320mV	0.1mV	±(0.5+1)
V~	3.2V	0.001V	±(2+5)
45Hz-1kHz	32V	0.01V	±(2+5)
	320V	0.	±(2+5)
(45-500Hz)	750V	1V	±(2+5)
Ω	320Ω	0.1Ω	±(2+1)
	3200Ω	1.0Ω	±(2+1)
	32kΩ	0.01kΩ	±(2+1)
	320kΩ	0.1kΩ	±(2+1)
	3.2MΩ	0.001MΩ	±(2+1)
	32MΩ	0.01MΩ	±(2+1)
→|+)))))	2.0V	0.001V	±(1+1) typical

Table 3. (cont)

FUNCTION	RANGE	RESOLUTION	ACCURACY	FULL SCALE BURDEN VOLTAGE (Typical)
A(v)	32mA	0.01mA	±(2+3)*	0.2V*
	320mA	0.1mA	±(2+3)	2.0V
	10A	0.01A	±(2+3)	0.5V
A~ 45Hz-1kHz (typical)	32mA	0.01mA	±(3+2)	0.2V
	320mA	0.1mA	±(3+2)	2.0V
	10A	0.01A	±(3+2)	0.5V

* Basic electrical specifications are defined over the temperature range from 20 to 30 degrees C for a period of 36 months after calibration.

Accuracy is specified as ±([% of reading] + [number of units in least significant digits]). In Touch Hold, accuracy is not specified for 300 **mV**⎓ and Ω functions when test circuit impedance exceeds 1 MΩ.

V~ and **A** ~ are average responding, calibrated for the rms value of sine waves.

Useful frequency response (typical) for 32V and 320V ranges, -0.5 dB at 10kHz, for 3.2V and 750V ranges, ±3 dB at 5 kHZ.

Table 3. (cont)

FUNCTION	MAXIMUM INPUT VOLTAGE (across input terminals	RESPONSE TIME (of digital display to rated accuracy)	INPUT IMPEDANCE	COMMON MODE REJECT ON RATIO (1kΩ unbalance)	NORMAL MODE REJECTION RATIO (digital display only)
V ~	1000Vdc 750VAC rms (sine)	<2s	>10MΩ in parallel with <50pF (AC coupled)	>60dB (dc to 60Hz)	
V ⎓	1000Vdc 750VAC rms (sine)	<1s	>10MΩ (input capacitance: <50pF)	>120dB (dc, 50Hz, or 60Hz)	>60dB (dc, 50Hz, or 60Hz)
300mV ⎓	500Vdc 500VAC rms (sine)	<1s	10MΩ (input capacitance: <50pF)	>120dB (dc, 50Hz, or 60Hz)	>60dB (dc, 50Hz, or 60Hz)

FUNCTION	MAXIMUM OVERLOAD (across input terminals)	RESPONSE TIME (of digital display to rated accuracy)	OPEN CIRCUIT TEST VOLTAGE (0°C to 50° C)	FULL SCALE VOLTAGE (0°C to 50°C)	
				Up to 3.2MΩ	Up to 32MΩ
Ω	500 Vdc 500VAC rms (sine)	<1s (up to 320kΩ) <2s (up to 3.2MΩ) <10s (up to 32MΩ)	<3.1Vdc (<2.8Vdc typical)	<440mVdc (<420mVdc typical)	<1.4Vdc (<1.3Vdc typical)

MAXIMUM VOLTAGE BETWEEN ANY TERMINAL AND EARTH GROUND (all functions)
1000Vdc 750VAC rms (sine)

FUSE PROTECTION
(300mA Terminal) 630mA/250V/1500A Interrupt Capacity Fusible Resistor (10A Terminal) 15A/600V Interrupt Capacity

Table 3. (cont)

FUNCTION	MAXIMUM OVERLOAD (across input terminals	TEST CURRENT	
		Test Current (typical)	V_F
→+ ıı))	500Vdc 500VAC rms (sine)	0.7mA 0.5mA 0.3mA 0.1mA	0.0V 0.6V 1.2V 2.0V

MP MASTER
MA36013